

**WHAT IS CLAIMED IS:**

1. A method for the digital control of an element of a printing machine (1) with an assignment (6, 6') of two non-coincident digital variables (2 and 2'), wherein, for successive assignments (6, 6') an integer assignment (6, 6')  
5 of small steps (3) of a first variable (2) to a large step (3') of a second variable (2') is carried out in such a way that for each assignment (6, 6') the numerical ratio remains constant or is changed in such a way that the assignment error (4, 4') never reaches the width (5) of the smaller steps (3) of the first variable (2) in any assignment (6, 6').
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2. The method as claimed in claim 1, wherein the numerical ratio of the assignment (6, 6') remains constant or changes in such a way that the assignment error (4, 4') never exceeds half the width (5) of the digital steps (3) of the smaller variable (2) in any assignment (6, 6').
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3. The method as claimed in claim 2, wherein it is used to control register in a multicolor printing machine (1) by controlling the production of lines of image points (33).
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4. The method as claimed in claim 3, wherein it is used to assign (6, 6') lines of image points (33) produced on the image cylinders (12, 12', 12'', 12''') to fixed angular sequences (16) of the image cylinders (12, 12', 12'', 12''').
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5. The method as claimed in claim 4, wherein, in order to achieve coincidence of register between the color separations (7, 7', ...) produced by the color printing units (17, 17', 17'', 17'''), said color separations are subdivided into areas (10', 10'', ..., 10<sup>n</sup>) which are assigned to one another, the areas (10', 10'', ..., 10<sup>n</sup>) consisting of a fixed number of lines of image points (33).
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6. The method as claimed in claim 5, wherein the assignment (6, 6') is based., on measuring the positions of elements (12, 12', 12'', 12''', 13, 13', 13'', 18) that carry images and substrates.

5 7. The method as claimed in claim 6, wherein the assignment of the areas (10', 10'', . . . , 10<sup>n</sup>) of the color separations (7, 7', . . . ) to one another, and the assignment (6, 6') of the lines of image points (33) to the angular sequences (16) is based on the acquisition and evaluation of the data (23) from register marks (19, 19', 19'', 19''') printed by the color printing units (6, 6', 6'', 6''').

10 8. Apparatus for implementing a method as claimed in claim 7 with a control device (8, 8', 8'', 8'''), wherein the control device (8, 8', 8'', 8''') is designed in such a way that, for a successive assignment (6, 6') of two non-coincident digital variables (2 and 2'), it performs an integer assignment (6, 6') of the small steps (3) of the first variable (2) to a large step (3') of the second variable (2') in such a way that the numerical ratio remains constant or is changed in such a way that the assignment error (4, 4') never reaches the width (5) of the smaller steps (3) of the first variable (2) in any assignment (6, 6').

15 20 9. The apparatus as claimed in claim 8, wherein the control device (98, 8', 8'', 8''') has a memory (20, 20', 20'', 20''') in which, during each assignment (6, 6') of the smaller steps (3) of the first variable (2) to the larger steps (3') of the second variable (2'), the remaining, non-integer residual (4, 4') is set and, during 25 the calculation of the assignment of the steps (3) of the smaller variable (2) to the next step (3') of the larger variable (2'), the control system (8, 8', . . . 8'', 8''') adds this residual (4, 4').

10. The apparatus as claimed in claim 9, wherein the control device (8, 8', 8'', 8''') is designed in such a way that, for an assignment (6') of the steps (3, 3'), it forms the sum of the magnitude (34) to be assigned and the assignment error (4') of the previous assignment (6') of steps (3 and 3'), and  
5 rounds up if the magnitude exceeds half a smaller step (3) and rounds down if the magnitude falls below half a smaller step (3).

11. The apparatus as claimed in claim 10, wherein the control device (8, 8', 8'', 8''') is used to control the register of a multicolor printing  
10 machine (1), by controlling the image production equipment (14, 14', 14'', 14''') assigned to the image cylinders (12, 12', 12'', 12''') for the production of lines of image points (33) on the image cylinders (12, 12', 12'', 12''').

12. The apparatus as claimed in claim 11, wherein the control  
15 device (8, 8', 8'', 8''') is set up in such a way that it assigns the lines of image points (33) to fixed angular sequences (16) of the image cylinders (12, 12', 12'', 12''').

13. The apparatus as claimed in claim 12, wherein the control  
20 device (8, 8', 8'', 8''') is set up in such a way that, in order to achieve coincidence of register between the color separations (7, 7', . . .) produced by the color printing units (17, 17', 17'', 17'''), it subdivides said color separations into areas (10', 10'', . . ., 10<sup>9</sup>) and assigns these areas (10', 10'', . . ., 10<sup>9</sup>) to one another, the areas (10, 10'', . . ., 10<sup>9</sup>) consisting of a fixed number of lines of image points (33).  
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14. The apparatus as claimed in claim 12, wherein it has sensors (21) for measuring the position of elements (12, 12', 12'', 12''', 13, 13', 13'', 18) that carry images and substrates, and the control device (8, 8', 8'', 8''') is set up in such a way that it performs the assignment (6, 6') on the basis of the position  
30 measurement.

15. The apparatus as claimed in claim 14, wherein the control device (8, 8', 8'', 8''') is set up in such a way that it initiates the printing of register marks (19, 19', 19'', 19'''), wherein a sensor (22) is arranged to detect the register marks (19, 19', 19'', 19'''), and wherein the control device (8, 8', 8'', 8''')  
5 is set up in such a way that it evaluates the data (23) from the register marks (19, 19', 19'', 19''') in such a way that the assignment of the areas (10', 10'', . . . , 10<sup>n</sup>) of the color separations (7, 7', . . . ) to one another is carried out to achieve coincidence of register, and the assignment (6, 6') of the lines of image points (33) to angular sequences (16) is carried out to reduce the error.
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16. A printing machine (1) having a control device (8, 8', 8'', 8''') for implementing a method as claimed in claim 1, wherein the control device (8, 8', 8'', 8''') is designed in such a way that, for a successive assignment (6, 6') of two non-coincident digital variables (2 and 2'), it performs an integer assignment (6, 6') of the small steps (3) of the first variable (2) to a large step (3') of the second variable (2') in such a way that the numerical ratio remains constant or is changed in such a way that the assignment error (4, 4') never reaches the width (5) of the smaller steps (3) of the first variable (2) in any assignment (6, 6').
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